PATENT
Docket No.: RAPI-0011 (032761-013)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Andreas F. Kotowski et al.	CONFIRMATION NO.: 2361
SERIAL NO.:	10/086,473	
FILING DATE:	February 28, 2002	
TITLE:	X-Ray Detector System Having Low Z Material Panel	
EXAMINER:	Nguyen, Minh T.	
ART UNIT:	2816	

CERTIFICATE OF MAILING

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APPEAL BRIEF

Dear Sir:

This paper is in support of a Notice to Appeal filed December 30, 2005, of the Office Action dated October 3, 2005, to the Board of Patent Appeals and Interferences.

Please charge any additional required fee or credit any overpayment not otherwise paid or credited to our deposit account No. 50-1698.

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Real Party in Interest

Rapiscan Security Products (USA), Inc.

Related Appeals and Interferences

None.

Status of Claims

Claims 1-42 have been rejected and are on appeal.

Status of Amendments

No amendments after final have been filed.

Summary of Claimed Subject Matter

The invention relates to the detection of concealed objects using x-ray imaging. Human tissue scatters x-rays from an x-ray source. Weapons, by comparison, are typically made of metal and absorb x-rays from a source. An x-ray detector placed at the source receives backscattered x-rays from human tissue, but does not receive radiation absorbed by a weapon. An image generated from detector signals therefore depicts human tissue as light regions, and weapons as dark regions. The problem is, however, that a dark image due to a weapon is indistinguishable from a dark image due to an empty background; both of these absorb x-rays rather than reflect them back to the detector. A handgun carried under the arm of a person who is standing against an empty background cannot be detected because both the handgun and the empty background appear as dark regions in an x-ray image, with the handgun effectively blending into the background. This situation is illustrated in FIG. 2.

To overcome this limitation, the invention proposes to place a low Z material panel (400) behind a person (12) being inspected for concealed objects. The low Z material panel, unlike an empty background, reflects x-rays from a source (30) back towards the detector (17). A concealed metallic object will block out the x-rays reflected by the low z-material panel on their way back to the detector, causing the metallic object to contrast well in the image. Such a situation is illustrated in FIG. 5, which in the left-hand portion shows a panel 500 being used to provide contrast for a metal pipe. Without the panel 500, the pipe blends into the background, as seen in the right-hand portion of the drawing. The low z-material can be chosen such that it does not backscatter as much radiation as human tissue, so that it still appears darker than the human figure, allowing the human figure to be distinguishable in the image as well.

Grounds of Rejection to be Reviewed on Appeal

Whether claims 1-42 are unpatentable under 35 U.S.C. 103(a) over U.S. Pat. No. 4,974,247 (Friddell) in view of U.S. Pat. No. 5,181,234 (Smith).

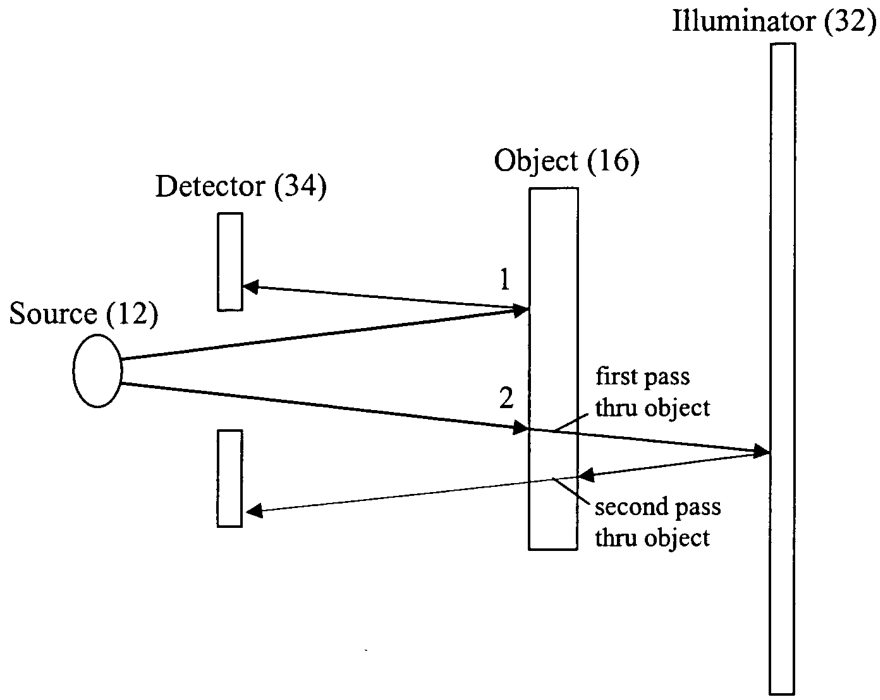
Argument

Claims 1-27, 30-32, 35-37 and 4-42

Claims 1, 14 and 15, from which the remaining claims depend, all recite, *inter alia*, the use of x-rays that expose the object under inspection "to an x-ray dose in the range of about 1 microRem to about 10 microRem." This feature is not disclosed in Friddell, and would not be an obvious modification thereof in view of Smith. Unlike Smith and the present invention, Friddell is directed to the inspection of inanimate objects whose radiation exposure is not a safety concern. The distinction is important because, as explained below, Friddell requires the use of high radiation levels for proper operation, and would become inoperative under lower, safe levels. Reducing the dosage in Friddell to match the claimed "about 1 microRem to about 10 microRem" is therefore not simply a matter of "adjusting the range to obtain the optimum condition"[1] as it would render the Friddell system inoperative.

The system of Fridell, as diagrammed below, relies on two types of x-ray interaction with the object under inspection.[2] The first interaction (designated 1) is between x-rays emitted by the source and backscattered by the object back towards the detector. The second type of interaction (designated 2) is between x-rays emitted by the source, passing through the object in a first pass, then reaching the illuminator, being reflected back by the illuminator to pass back through the object in a second pass, and then finally arriving at the detector.

[1] Office Action mailed October 3, 2005, p. 4, ll. 12-13.
[2] Friddell, Abstract; col. 2, ll. 23-63.



Friddell relies on both of these interactions to generate an image of the object, and configures his system to operate under conditions dependent on both interactions. The second type of interaction, which involves two passes of radiation through the object, necessitates radiation intensities sufficiently high for these passes to occur not only once, but twice! Thus the object 1) must be exposed to radiation that is high enough to be able to pass through it twice, and 2) the object receives a double dose of such radiation. Dosages of such intensity are wholly unsuitable for human exposure.[3] Conversely, dosage reduction, as a matter of "adjusting the range to obtain optimum condition," is not an option because it would vitiate the second type of interaction, on which Friddell relies for proper operation. Therefore while Smith shows the application of x-ray imaging in human inspection, one of ordinary skill in the art would not be able to modify Friddell based on the teachings of Smith because Friddell needs the unsuitably heavy dosage levels and cannot operate without them. The MPEP cautions against such

[3] Friddell in fact is concerned exclusively with the inspection of inanimate objects such as aircraft wings and fuselages (col. 1, ll. 57-58), multi-level boxes (col. 6, l. 55), hydrocarbon plastics (col. 7, l. 2), and hydraulic hoses (col. 7, l. 14), and therefore does not need to be mindful of safe human exposure levels.

unworkable modifications of a prior art reference in bold heading format, stating that "The proposed modification cannot render the prior art unsatisfactory for its intended purpose."[4]

Claim 28, 33 and 38

Claims 28, 33 and 38 specify a radiation dose of about 1 microRem to about 5 microRem. This range ensures exposure levels that may be even less that the "about 1 microRem to about 10 microRem" of independent claims 1, 14 and 15. Friddell does not teach or suggest such exposure levels, and, as discussed above, is not modifiable in view of Smith to operate at such levels. For this reason at least the obviousness rejection of claims 28, 33 and 38 based on Friddell in view of Smith should be withdrawn.

Claims 29, 34 and 39

Claims 29, 34 and 39 specify a radiation dose of about 3 mircoRem. Again there is no teaching or suggestion in Friddell that such dosage can be used because Friddell is not modifiable in view of Smith to reduce the radiations under which it can operate. Accordingly the obviousness rejection of claims 29, 34 and 39 based on the combination of Friddell and Smith should be withdrawn.

[4] Manual of Patent Examining Procedure, §2143.01V, citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Claims Appendix

1. A method for detecting concealed items on or in an object, the method comprising:

producing a pencil beam of x-rays from an x-ray source directed toward said object;

scanning said beam of x-rays over the surface of said object; and

detecting x-rays scattered from said beam of x-rays as a result of interacting with said object and a low Z material panel, said object located between said detector and said panel, said detecting comprising differentiating x-rays back scattered by the object from those back scattered by the low Z material panel,

wherein said pencil beam of x-rays exposes said object to an x-ray dose in the range of about 1 microRem to about 10 microRem.

2. The method of claim 1 further comprising generating a signal representative of the intensity of the x-rays scattered.

3. The method of claim 2 further comprising presenting said signal on a display.

4. The method of claim l wherein said low Z material panel is made polyethylene.

5. The method of claim 1 wherein said low Z material panel is made of epoxy.

6. The method of claim 1 wherein said low Z material panel is made of water.

7. The method of claim 1 further comprising a radiation shield coupled to said low Z material panel, said low Z material panel located between said object and said radiation shield.

8. The method of claim 7 wherein said radiation shield comprises an x-ray absorbing material.

9. The method of claim 8 wherein said x-ray absorbing material is steel.

10. The method of claim 8 wherein said x-ray absorbing material is lead.

11. The method of claim 7 wherein said radiation shield is about 1mm thick.

12. The method of claim 1 wherein said low Z material panel is located above said object.

13. The method of claim 1 wherein said low Z material panel is located below said object.

14. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for detecting concealed items on or in an object, said method comprising:

producing a pencil beam of x-rays from an x-ray source directed toward said object;

scanning said beam of x-rays over the surface of said object; and

detecting x-rays scattered from said beam of x-rays as a result of interacting with said object and a low Z material panel, said object located between said detector and said panel, said detecting comprising differentiating x-rays back scattered by the object from those back scattered by the low Z material panel,

wherein said pencil beam of x-rays exposes said object to an x-ray dose in the range of about 1 microRem to about 10 microRem.

15. An apparatus to detect concealed items on or in an object, the apparatus comprising:

an x-ray source to produce a pencil beam of x-rays directed toward said object;

a scanner to scan said beam of x-rays over the surface of said object; and

a detector to detect x-rays scattered from said beam of x-rays as a result of interacting with said object and a low Z material panel, said object located between said detector and said panel, said detector differentiating x-rays back scattered by the object from those back scattered by the low Z material panel,

wherein said pencil beam of x-rays exposes said object to an x-ray dose in the range of about 1 microRem to about 10 microRem.

16. The apparatus of claim 15 further comprising a processor to generate a signal representative of the intensity of the x-rays scattered.

17. The apparatus of claim 16 further comprising a display to display said signal.

18. The apparatus of claim 15 wherein said low Z material panel is made polyethylene.

19. The apparatus of claim 15 wherein said low Z material panel is made of epoxy.

20. The apparatus of claim 15 wherein said low Z material panel is made of water.

21. The apparatus of claim 15 further comprising a radiation shield coupled to said low Z material panel, said low Z material panel located between said object and said radiation shield.

22. The apparatus of claim 21 wherein said radiation shield comprises an x-ray absorbing material.

23. The apparatus of claim 22 wherein said x-ray absorbing material is steel.

24. The apparatus of claim 22 wherein said x-ray absorbing material is lead.

25. The apparatus of claim 21 wherein said radiation shield is about 1mm thick.

26. The apparatus of claim 15 wherein said low Z material panel is located above said object.

27. The apparatus of claim 15 wherein said low Z material panel is located below said object.

28. The method of Claim 1, wherein said pencil beam of x-rays exposes said object to an x-ray dose in the range of about 1 microRem to about 5 microRem.

29. The method of Claim 1, wherein said pencil beam of x-rays exposes said object to an x-ray dose of about 3 microRem.

30. The method of Claim 1, further comprising using said detected x-rays to generate an image having a coefficient of variation (CV) in the range of about 2 to about 10 percent.

31. The method of Claim 28, further comprising using said detected x-rays to generate an image having a coefficient of variation (CV) in the range of about 2 to about 10 percent.

32. The method of Claim 1, wherein said pencil beam of x-rays is generated by an x-ray tube operating at about 50 KV and 5 mA.

33. The device of Claim 14, wherein said pencil beam of x-rays exposes said object to an x-ray dose in the range of about 1 microRem to about 5 microRem.

34. The device of Claim 14, wherein said pencil beam of x-rays exposes said object to an x-ray dose of about 3 microRem.

35. The device of Claim 14, further comprising an imaging system adapted to use said detected x-rays to generate an image having a coefficient of variation (CV) in the range of about 2 to about 10 percent.

36. The device of Claim 33, further comprising an imaging system adapted to use said detected x-rays to generate an image having a coefficient of variation (CV) in the range of about 2 to about 10 percent.

37. The device of Claim 14, wherein said pencil beam of x-rays is generated by an x-ray tube operating at about 50 KV and 5 mA.

38. The apparatus of Claim 15, wherein said pencil beam of x-rays exposes said object to an x-ray dose in the range of about 1 microRem to about 5 microRem.

39. The apparatus of Claim 15, wherein said pencil beam of x-rays exposes said object to an x-ray dose of about 3 microRem.

40. The apparatus of Claim 15, further comprising an imaging system adapted to use said detected x-rays to generate an image having a coefficient of variation (CV) in the range of about 2 to about 10 percent.

41. The device of Claim 38, further comprising an imaging system adapted to use said detected x-rays to generate an image having a coefficient of variation (CV) in the range of about 2 to about 10 percent.

42. The device of Claim 14, wherein said pencil beam of x-rays is generated by an x-ray tube operating at about 50 KV and 5 mA.

Evidence Appendix

None.

Related Proceedings Appendix

None.

Please charge any additional required fee or credit any overpayment not otherwise paid or credited to our deposit account No. 50-1698.

Respectfully submitted,

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